[0069] The Transducer Design Advisor supports a user interface for specifying input parameters to the acoustic stack model. Preferably. this acoustic stack model uses the Krimholtz-Leedom-Matthaei (KLM) approach to create a one-dimensional model of the acoustic and electrical layers and components of the transducer. Using this user interface, the user can view and edit any of the parameters in an acoustic stack model. The user can also designate any of the acoustic stack model parameters to be DOE input variables.

[0070] In the LssChoices window 29 (see FIG. 7), the user makes a choice which determines where the user is going to get the acoustic stack model input parameters, or whether the user wants to use the acoustic stack model at all. There are four possible choices: (1) If the Transducer Design Advisor was successful in locating an acoustic stack model input file when it opened the user's existing file set, it suggests that the user simply use the parameters it has found. (2) If the Transducer Design Advisor was not successful in locating an acoustic stack model input file, the user can choose to read in acoustic stack model parameters from a file in a different location. (3) The user can also choose to start from a blank model and fill in all the parameter values by hand. (4) The user can also choose to skip over the entire acoustic stack model input window and not use an acoustic stack model at all. The acoustic stack model input parameters are kept in a text file with a ".xdcr" filename extension. If the user is editing an existing set of the Transducer Design Advisor files, the program will look for a file whose root filename is the same as the other Transducer Design Advisor files (e.g., "c348_master.exic", "c348.tplt", etc.), and which has the ".xdcr" filename extension, e.g., "c348.xdcr". If the Transducer Design Advisor finds such a file in the same directory as the user's other files and is successful in reading the file contents into a memory object, then the Transducer Design Advisor will suggest that the user start with these parameters, which the user can edit or leave as they are. If the Transducer Design Advisor cannot locate a file in the same directory as the user's other files, or if it cannot successfully read the

file contents, then it disables the first choice, and the user must pick one of the other three choices.

[0071] Starting from a completely blank model and entering all the parameters by hand will be tedious. Therefore, it is preferred that the user start with some existing acoustic stack model input model. A Samples folder is provided with the Transducer Design Advisor. The Samples folder preferably contains acoustic stack models for a sampling of different probe models and types that are in actual production for one or more commercial ultrasound imagers. Since new probe designs are often similar to existing probes, these models provide a convenient starting place to begin a new design.

[0072] Once the user has made his/her choice, the user clicks the Next button to move to the next window. Unless the user has chosen the "skip acoustic stack model" option, the user proceeds to the acoustic stack model input (LssInputs) window 30 (shown in FIG. 5).

[0073] The acoustic stack model program implements a mostly one-dimensional model of the acoustic stack. It uses the KLM model, and allows a user-defined number of layers in front of and behind the piezoelectric crystal, as well as a user-defined number of electrical components. The acoustic stack model input window allows the user to examine and modify the parameters of any component in this model, as well as change the number of layers in the acoustic or electrical chains. In addition, the user can designate any number of parameters as DOE variables, meaning that they will be available to be used as DOE input variables, and can participate in optimization experiments along with all of the parameters which relate to aperture geometry. If the user specifies one or more acoustic stack model input parameters as DOE variables, then the acoustic stack model will be invoked on each row of the DOE matrix to recalculate the impulse response of the probe.

[0074] The acoustic stack model input window 30 gives the user a graphical view of the acoustic stack model, as seen in FIG. 5. Although the acoustic stack model program itself supports any number of layers, in this window there is only room for seven layers in the front, back and electrical parts of the model. Layers that are not used in the current model are shown with the colors dimmed out. Each rectangle 32 on the screen acts like a button, which, when left-clicked by the mouse, opens up a detail window (e.g., see FIG. 8). The large rectangle 34 labeled "Parameters..." in the lower left allows the user to view and edit parameters that control the overall model, instead of a specific layer. When the user clicks rectangle 34, the user will see a new window appear (not shown). The first three text items in this new window control the number of layers to the front of the crystal (toward the patient), to the back of the crystal, and in the electrical stack, respectively. To change the number of active layers, the user enters a new integer greater to or equal to zero and presses the Enter key on the user keyboard. The number of rectangles that are brightly colored and dimmed out will change accordingly.

[0075] When the user clicks the square 36 which represents the piezoelectric crystal, or any one of the acoustic or electrical stack rectangles 32 that is not dimmed out, a Layer Properties window will appear. One such window 40, shown in FIG. 8, is produced when the box for front layer 1 (shown in FIG. 5) is clicked on. For all layers and the crystal, the same list of parameters will be shown in the Layer Properties window. However, depending on the particular role that this layer plays in the acoustic or electrical stack, various parameters will be grayed out, indicating that they are not used in this role. A button 44 appearing on the Layer Properties window provides an interface to an SQL materials properties database. Below this button is a scrolling list 42 of parameters. For each parameter, the parameter name is followed by a short descriptive string, followed by the current parameter value. The user can change the parameter value for any parameter which is not grayed out by clicking in the right-hand column (Value)